

the other hand, means large loss to crops along river bottoms.

An account of the floods in the Arkansas Valley and the rains which produced it is given elsewhere in this REVIEW. (See p. 329.) Attention is here directed to the heavy rains of June 7-9, which apparently culminated at Wichita in a 24-hour fall of 6.68 inches on the 8th-9th. The magnitude of this rainfall was clearly a result of a favorable pressure distribution over the territory embraced between the Texas Panhandle in the southwest and lower Michigan directly to the northeast. A line connecting these two points passes directly over southeastern Kansas. The exceptional feature of the rainfall was the rather narrow zone of greatest intensity, which seems to have paralleled the Arkansas River valley, although full reports are needed to outline its exact distribution.

The pressure distribution.—By reference to Charts I and II (see track No. 1 of Chart I and track No. 3 of Chart II) it may be seen that on the morning of the 7th an anticyclone had advanced from Canada to South Dakota, as a result of which northerly winds prevailed over Kansas and Nebraska. In the succeeding 24 hours this anticyclone moved eastward to Minnesota, thus causing east and southeast winds over Kansas and at first light rain. Pressure was low in the Rocky Mountain region, and by the morning of the 9th a weak cyclone had advanced to the Texas Panhandle. Central pressure in the

anticyclone had increased to 30.30 inches in the meantime, thus producing a moderate gradient for southeast winds over Kansas. Surface temperatures were lower to the westward than to the east and southeast, and we must assume that the warmer and moister air that passed over Kansas overrode the colder air to the west and northwest, thus lowering its temperature to the dewpoint and causing continuous precipitation over a time that depended on the rapidity of movement of the cyclone and anticyclone, respectively. There was practically no movement of these, or very little movement on the 10th, and the rainfall continued in Missouri and Arkansas on that date.

The writer has previously found that heavy rains in Kansas¹ depend largely upon the slow movement of cyclones over the State in conjunction with anticyclones situated over Minnesota or the lake region.

From a consideration of these facts it seems reasonable and justifiable to believe that the occurrence of a pressure distribution favorable to heavy rainfall, heavy because continued for several hours, is a consequence of the orderly sequence of weather events and is not necessarily to be referred back to the pressure distribution at some previous time in a far distant place. In other words, that the vicissitudes of rainfall, whether light or heavy, are intensely local rather than general.

¹ MO. WEATHER REV. 43:287.

NOTES, ABSTRACTS, AND REVIEWS.

THE SIZE OF METEORS.

[Reprinted from *Science*, New York, June 22, 1923, page viii, of supplement.]

That meteors as bright as the brightest star are no bigger than small bird shot is a conclusion drawn by Prof. F. M. Lindeman and Mr. C. M. Dobson, authors of a recent article in the *Proceedings of the Royal Society*. A meteor as bright as the moon would, they find, be only an inch in diameter and would weigh about 2 ounces.

As a result of their study, the authors conclude that the temperature of the upper atmosphere is much higher than was formerly supposed. It has long been known that the fall of temperature with altitude continues only to a height of about 7 miles, where the temperature is as low as from 60° to 70° below zero Fahrenheit. But from this altitude as high as sounding balloons have gone, which is about 15 miles, the temperature has remained about the same. This is what is known as the stratosphere or isothermal layer.

The recent investigators of meteors now conclude that this layer of fairly constant temperature extends up to a height of 30 miles, above which the temperature again rises, so that at altitudes of from 30 to 50 miles it reaches considerably above the freezing point, or about the average temperature at the earth's surface.

The density of the air at a height of 60 miles is calculated to be one-millionth of that at the surface. It is thought to be composed largely of ozone, and its high temperature is thought to be due to heating by the long-wave length heat waves from the surface of the earth.

GLACIOLOGY.

By C. S. WRIGHT and R. E. PRIESTLEY.

This splendid quarto volume of xx plus 487 pages, 179 figures, 291 halftone plates, and xiv folded maps, is one of the several reports of the British Antarctic Expedition under the lamented Capt. R. F. Scott.

The chief topic is, of course, snow and ice, but also there are many interesting references to Antarctic weather (a subject ably discussed in another report of this expedition by Dr. G. C. Simpson) and polar climates. Meteorologists especially will find a hopeful interest in the possibility of a logical seasonal forecast in the region of McMurdo Sound. "Unless the Sound freezes early, before the advent of winter establishes the large horizontal temperature gradient between sea and land ice, the high winds caused by this temperature gradient favour rather the retention of existing conditions and are strongly against the freezing of the Sound late in the winter. We see, therefore, that the climatic conditions of the autumn months—March and April—are, in McMurdo Sound, those which decide the winter conditions in this region. It is circumstances of similar nature which cause the large differences between the climate in any one region, from one year to another."

As is well known, it is far from self evident how enough precipitation is obtained over the Antarctic, and then retained, despite evaporation, summer melt, and blizzard drift, to keep the entire continent perpetually covered with ice and snow. This puzzling problem is discussed, and the several methods by which precipitation is induced fully explained. Although neither accurate nor even approximately accurate measurements of either precipitation or ablation (loss by whatever process, except glacial flow) are possible in the Antarctic, the annual snowfall over the two to three million square miles of the low-lying barrier appears to be the equivalent of 12 to 24 inches of water. Approximately 7½ inches of this is the net annual gain that maintains the outward flow of the barrier ice.

In the chapter on the formation of ice crystals from vapor the important conclusion is reached that the form and nature of the snow or frost crystal depend essentially on the rate at which the crystal is grown, and not upon the temperature. Considerable attention is given to the